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USER'S GUIDE TO THE FLOOD DAMAGE ESTIMATION SYSTEM.(U)
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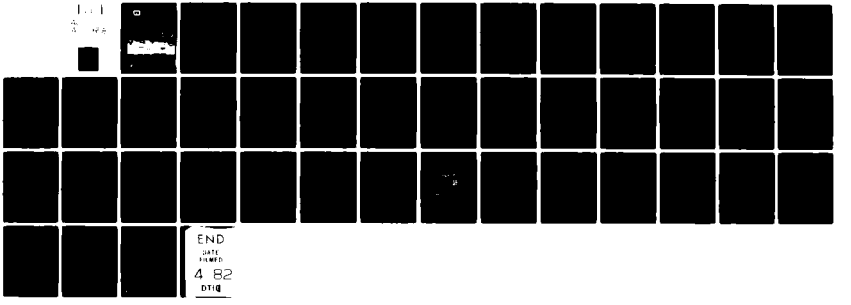

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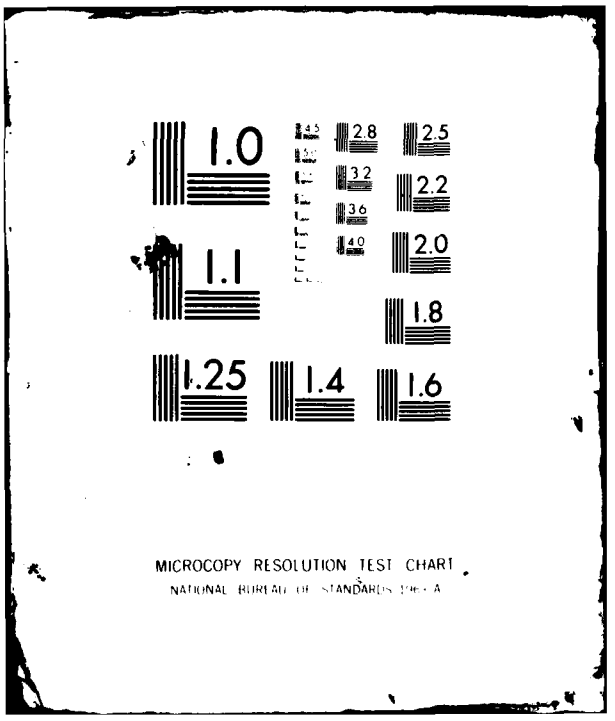
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INSTRUCTION REPORT K-82-1

USER'S GUIDE TO THE FLOOD DAMAGE ESTIMATION SYSTEM

by

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January 1982
Final Report

Prepared for U. S. Army Engineer Division, Lower Mississippi Valley
P. O. Box 80, Vicksburg, Miss. 39180

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER Instruction Report K-82-1	2. GOVT ACCESSION NO. AD-A111 968	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) USER'S GUIDE TO THE FLOOD DAMAGE ESTIMATION SYSTEM		5. TYPE OF REPORT & PERIOD COVERED Final report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Walter L. Enete		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U. S. Army Engineer Waterways Experiment Station Automatic Data Processing Center P. O. Box 631, Vicksburg, Miss. 39180		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Division, Lower Mississippi Valley P. O. Box 80, Vicksburg, Miss. 39180		12. REPORT DATE January 1982 13. NUMBER OF PAGES 38
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Available from National Technical Information Service, 5285 Port Royal Road, Springfield, Va. 22151.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Computer applications
Computer programs
Flood damage
Flood estimates

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report presents instructions for using a computer program in support of the flood damage estimation system of the Lower Mississippi Valley Division (LMVD). The program computes flood effects over geographic regions within LMVD in terms of acres inundated, crop damages, property damages, and persons affected.

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20. ABSTRACT (Continued)

Some principal features are:

a. Classification of areas of each LMVD District in terms of a water resource unit (WRU).

b. Use of linear interpolation techniques in computing flood effects except for crop damages.

c. Use of percentage factors for crop damage calculations.

d. Output directed to the user's time-sharing terminal for immediate use.

PREFACE

This report describes the general features of a computer program to estimate flood damages for the geographic regions of the U. S. Army Engineer Division, Lower Mississippi Valley (LMVD). The work in developing the computer program and preparing this report was done as part of the application support provided to LMVD by the Automatic Data Processing (ADP) Center of the U. S. Army Engineer Waterways Experiment Station (WES).

Mr. Walter L. Enete of the Computer-Aided Design Group (CADG), ADP Center, developed the program and prepared this report under the direction of Mr. Paul K. Senter, CADG. The work was done under the supervision of Mr. William A. Price, Chief, CADG, and Dr. N. Radhakrishnan, Special Technical Assistant, ADP Center, and under the general supervision of Mr. Donald L. Neumann, Chief, ADP Center.

Liaison was maintained between WES and LMVD by means of office conferences and telephone communications with Mr. Norwyn Johnson, Economics Branch, who was principal coordinator for LMVD.

Directors of WES during the preparation and publication of this report were COL Nelson P. Conover, CE, and COL Tilford C. Creel, CE. Technical Director was Mr. F. R. Brown.

CONTENTS

CONVERSION FACTORS, INCH-POUND TO METRIC (SI) UNITS OF MEASUREMENT

Inch-pound units of measurement used in this report can be converted to metric (SI) units as follows:

Multiply	By	To Obtain
acres (U. S. survey)	4046.873	square metres
feet	0.3048	metres

USER'S GUIDE TO THE FLOOD DAMAGE ESTIMATION SYSTEM

PART I: INTRODUCTION

Purpose

1. This report describes the general features of a computer program to estimate flood damages and presents instructions for its use. It is written for the Waterways Experiment Station (WES) computer and operates in time-sharing mode.

Computational Procedures

2. Basic computations in the program are performed using data taken from curves developed by plotting area inundated versus water height above mean sea level (msl). Flood impacts are computed in terms of acres flooded, crop losses, property damage, and persons affected. Crop losses are computed using the cleared acres flooded multiplied by the distribution of crops in the flooded area.

Scope of Work

Model

3. The program is designed for coverage of geographic regions within the Lower Mississippi Valley under control of the Lower Mississippi Valley Division (LMVD). Each District in LMVD is uniquely identified to permit consideration of flood damages within it independent of those within any other District or over the entire region. This is done by dividing each District into areas called water resource units (WRU). Damages for each WRU are computed in the program using a linear interpolation algorithm to determine damages from elevation-damage curves. Associated with each WRU are three gages for determining inundation

levels in the WRU. These gages are identified as the "local," "with project reference," and "without project reference" gages, respectively. More discussion of these gages follows in paragraphs 10 and 11.

Conditions considered

4. Two basic conditions are considered in the program: flooding under existing conditions in which all current flood control projects are assumed in place, and flooding under conditions in which all Corps projects are assumed to be removed. Gage readings for each of these conditions are required on input.*

Method

5. In the calculations of all flood effects except crop damages, a straight linear interpolation procedure is used. For crop damages, the cleared acres flooded are multiplied by the percentage distribution factors for each crop grown in the WRU. The resulting acres are then multiplied by dollar estimates of production and overhead costs lost per acre to give the dollar value of the crop losses. By adjusting the per acre dollar estimates based upon the time of year, crop losses may be determined at any time.

Generalized program flow

6. Figure 1 presents a generalized flow diagram of the program beginning with the request to mount the disk pack containing the programs and master data files and ending with final program termination. See Part III for instructions on using the program in the time-sharing mode.

---

* Note: Currently, the "without project" conditions and multiple floods are not considered.

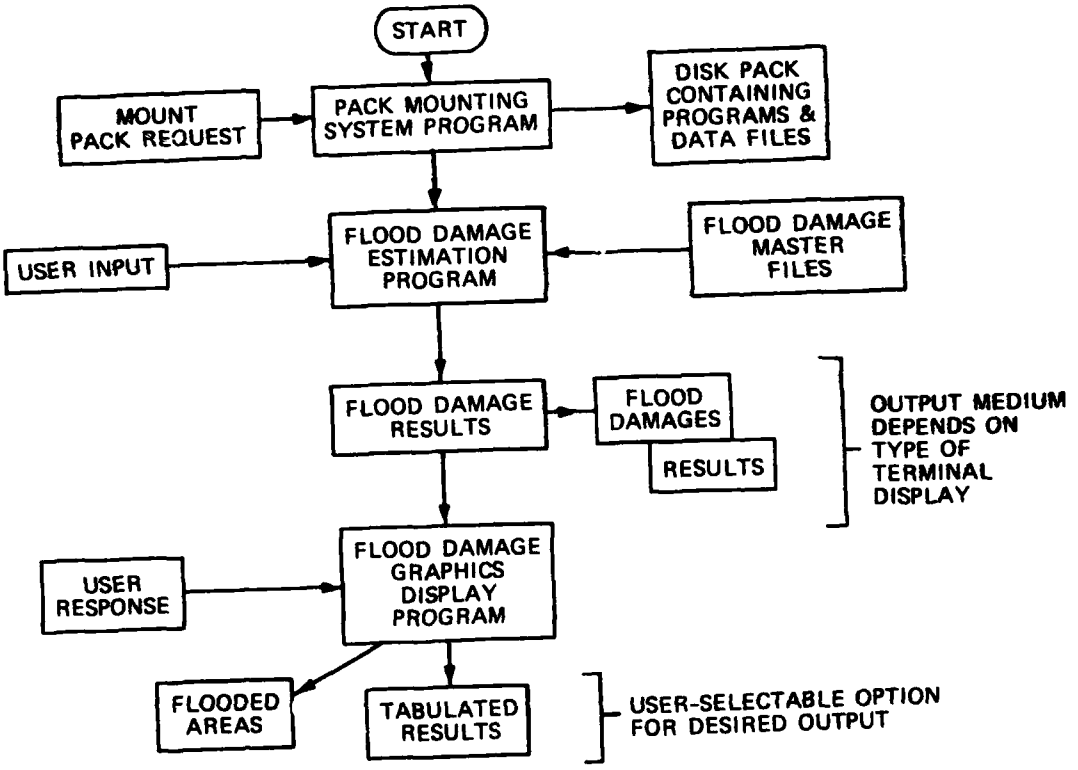


Figure 1. General flow diagram

PART II: METHODOLOGY

Water Resource Unit Specification

7. WRU's are areas subject to flooding directly by the river or by backwater. Each WRU is identified as a protected or unprotected area (unprotected for example, is that area between a river and a levee). Its features are contained in the program in the form of data sets consisting of points from stage-area, stage-damage, and stage-persons curves and other data on the WRU's relationship to states, counties, congressional districts, streams, basins, and Districts.

Types of Flood Effects

8. Four types of flood effects are computed in the program: area inundated in terms of acres; crop damages by crop type, acres, and dollar value; property damage by type and dollar amount; and numbers of persons affected. Dollar damages are computed in current dollars by indexing the stage-damage curves to current year values.

Stage Curves

9. Stage curves can best be understood by referring to a typical one such as shown in Figure 2. This is a stage-area curve for an area inundated within a WRU. Note that the gage readings are converted to feet msl. The program requires the gage readings in feet msl; it does not convert them to msl. Points p_0, p_1, p_2,...,p_6 are picked off the curve in the form of ordered pairs and stored with their respective WRU. A maximum of 10 such points is used for each WRU. The curves are stored for area inundated, property values by type, and persons affected by flood.

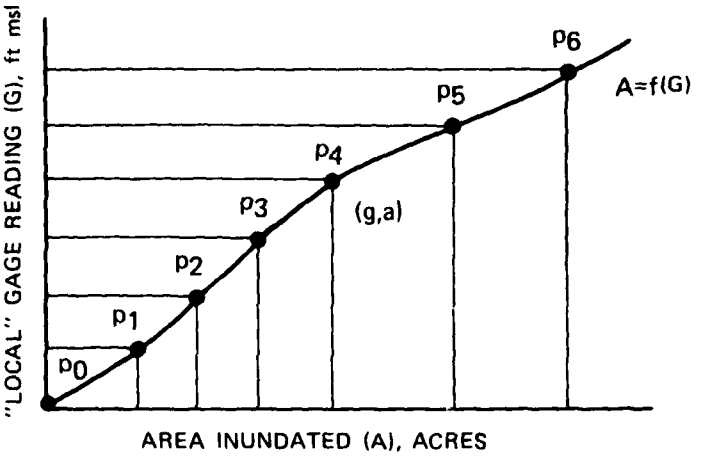


Figure 2. Stage-area curve

Gage Curves--Specification and Relationships

10. As stated previously, each WRU has three gages associated with it: a local gage, a with project reference gage, and a without project reference gage.* These gages are related by gage relationships in the data files so that, using only those gages supplied at input, the local gages (if not given) may be computed for use in determining the appropriate flood effects.

11. The with project reference (W-P) gage is the gage used to obtain a reading for the local gage of the WRU when that gage reading is missing and flood effects are desired for the WRU with the Corps flood control project in place. The without project reference (W/O-P) gage is the gage used to compute a local gage reading when all Corps projects are assumed to be removed. The readings for the local gage are obtained through a linear interpolation process as described in Appendix A. Each reading is computed from stored "gage-gage" curves derived from known

* Currently, no without project reference gage is stored for each WRU.

hydraulic relationships between the local gage and the W-P gage, and the local gage and the W/O-P gage.

12. Specification of the local, W-P, and W/O-P gages for a WRU is very critical to proper processing in the program. These must be selected in such a way that each WRU is essentially locked in with its neighbors by the gages associated with it.

13. Proper program execution requires that for each WRU its local gage and reading be known in order to use the WRU stage curves for flood effects calculations. If this gage is not provided at input, it must be calculated from the appropriate gage relationship. Normally, the gages and their readings provided the program at run time are those on the mainstem river.

14. Determination of the local gage reading, when not given, will be made using the gage-gage curves provided by the Districts for all WRU's. These curves will relate the W-P and W/O-P gage readings to the local gage so that the local gage reading may be determined if not known. A typical curve for a W-P gage is shown in Figure 3. Use of such a curve in the computer program is by straight linear interpolation. The curve is stored by picking corresponding pairs (b,a) and inputting via

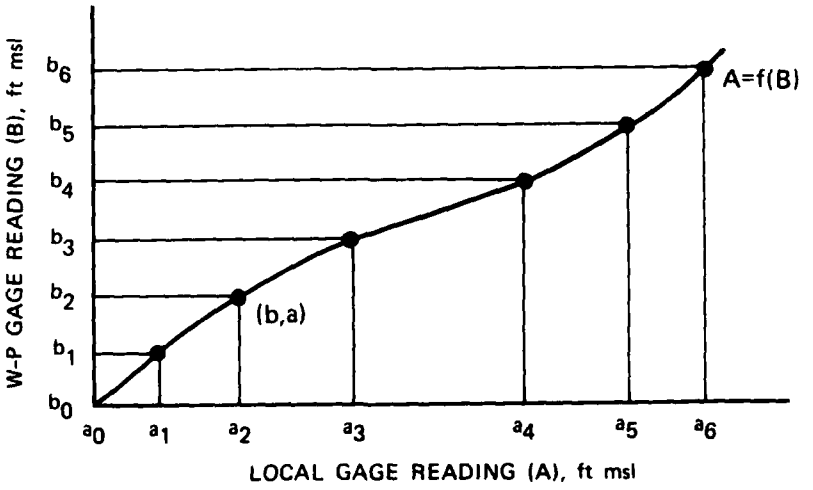


Figure 3. Typical gage-gage curve

cards the number of pairs and the values for each pair. The values (b_0, b_1, b_2,...,b_i, $i \leq 10$) represent the water levels in feet msl for the W-P gage. The values (a_0, a_1, a_2,...,a_i, $i \leq 10$) are the readings for the local gage at the predetermined W-P gage. Space is provided in the file for a maximum of 10 pairs for each gage-gage curve. After storage of the gage pairs, the user is only required to provide readings for any selected gages. The program will use them and compute the local gage readings for all WRU's for which an interdependence can be established between the given gages and the gages for the WRU. Those for which no interdependence can be established are omitted from any flood effects calculations. Refer to Appendix A for a more detailed discussion of the above concepts.

PART III: DATA REQUIREMENTS PREPARATION

15. Minimal data preparation by the user is required for program execution. The number of gages, each gage code and its associated reading, and the per acre crop costs for the seven crop types constitute all necessary data input for the program. These data are entered in free-field format with spaces or commas separating each data item.

16. Program output consists of terminal printer and stored file data. The data listed on the terminal printer are the detailed and summarized damages for the WRU's selected within the program. Selected WRU's are those for which a gage reading is input or computed using the gage-gage algorithm described in Appendix A. Additionally, these data are stored on disk pack files for use in a graphics display program. See Appendix B for instructions on use of this program. Figure 4a shows an example execution of the flood effects program. At this point the program will compute and print out flood damages for all WRU's affected. Results will also be stored for use in the graphics program.* See Figure 4b for an example of the flood damages printout.

17. At the user's option, damages may be accumulated and displayed by three geopolitical features: state, county, and congressional district. To permit this, each WRU code is stored in a random access master file along with a series of codes identifying the state, county, and congressional district containing it. A second random access file contains the associated names for the states, counties, and districts within LMVD. The first file is keyed to WRU codes and the second to the code of the state, county, and congressional district. Figure 5 is an example of the geopolitical output. As will be noted, the damages vary from one geopolitical entity to the next, reflecting the fact that each is different in composition; i.e., not all WRU's in one congressional district are in the same county.

---

* Note: This will cause data from previous runs to be destroyed.

LOG ON TO THE COMPUTER UNDER YOUR USERID AND PASSWORD. ACCESS THE PROGRAM, G100B, USING READ PERMISSION AS INDICATED. FOLLOW STEPS BELOW (RESPONSES ARE UNDERLINED):

```
*FRN  PLIB.G100B.D
INPUT NUMBER OF GAGES.
=1
INPUT EACH GAGE CODE & READING.
=16653-02,145.
VED    1 145.00 16653-01
VED    2 145.00 16653-02
VED    3 145.00 16653-02
VED    4 139.20 16653-03
VED    5 139.20 16653-03
INPUT CROP PRODUCTION COST FACTORS:
    (A) PREHARVEST PRODUCTION COSTS PER ACRE.
    (B) OVERHEAD AND NET RETURN COSTS PER ACRE.
SELECT EACH CROP CODE FROM THE LIST BELOW:
    P01-COTTON     P02-CORN     P03-SOYBEANS     P04-RICE
    P05-SUGARCANE  P06-WHEAT    P07-PASTURE      P08-GRAIN SORGHUM
ENTER NUMBER OF CROPS.
=2
ENTER FOR EACH CROP: THE CROP CODE, PREHARVEST PRODUCTION
                     COST PER ACRE, AND OVERHEAD COST PER ACRE.
=P01,5,4
=P03,3,5
 %PU          ACRES FLOODED
VED    2          0          956       21462       734
P03          860. $         6883
VED    3          0         1022        8083      1010
P01          460. $         5978
P03          460. $         3672
VED    4          0          476       16206       967
P03          386. $         3083
P04          426. $         3678
VED    5          0         4194       19569      2261

TOTAL:            0         8648       65270      4972
```

a. Initial input and results

Figure 4. Example execution

```
COMPUTE DAMAGES USING PER/ACRE $ CONSTANTS? (YES OR NO)
=Y
 PROPERTY DAMAGES
SPU: VED    2
CODE AMOUNT
P15 $          0
P16 $          0
P17 $          0
P18 $          0
P19 $          0

TOTAL: $          0
 PROPERTY DAMAGES
SPU: VED    4
CODE AMOUNT
P15 $          0
P16 $          0
P17 $          0
P18 $          0
P19 $          0
P10 $     194066
P13 $       7933

TOTAL: $     201999
 PROPERTY DAMAGES
SPU: VED    5
CODE AMOUNT
P15 $          0
P16 $          0
P17 $          0
P18 $          0
P19 $          0
P10 $    2631600
P11 $    1167000
P13 $       3033

TOTAL: $    3801633

GRAND TOTAL DAMAGES : $    4003632
PERIOD AFFECTED
VED0003        4
VED0005       48

TOTAL:    10
```

b. Final results

Figure 4. (Concluded)

```
COMPUTE AND DISPLAY DAMAGES BY GEOPOLITICAL UNIT? (Y OR N)
=Y


FLOOD EFFECTS FOR STATE : MISSISSIPPI
                  URBAN  CLEARED WOODED  OTHER  TOTAL
ACRES FLOODED:          0      4670     35775     3228      43673
   CROP DAMAGES
   TOTAL:          0
   PROPERTY DAMAGES
   TOTAL:          0
   PERSONS AFFECTED:    98

FLOOD EFFECTS FOR COUNTY: BOLIVIA
                  URBAN  CLEARED WOODED  OTHER  TOTAL
ACRES FLOODED:          0      4670     35775     3228      43673
   CROP DAMAGES
   TOTAL:          0
   PROPERTY DAMAGES
   TOTAL:          0
   PERSONS AFFECTED:    98

FLOOD EFFECTS FOR CONGRESSMAN : DAVID BOWEN
                  URBAN  CLEARED WOODED  OTHER  TOTAL
ACRES FLOODED:          0      4670     35775     3228      43673
   CROP DAMAGES
   TOTAL:          0
   PROPERTY DAMAGES
   TOTAL:          0
   PERSONS AFFECTED:     0


FLOOD EFFECTS FOR CONGRESSMAN : B. ANTHONY
                  URBAN  CLEARED WOODED  OTHER  TOTAL
ACRES FLOODED:          0      1978     29495     1744      33217
   CROP DAMAGES
   TOTAL:          0
   PROPERTY DAMAGES
   TOTAL:          0
   PERSONS AFFECTED:     0
```

Figure 5. Geopolitical results

APPENDIX A: GAGE-GAGE ALGORITHM

1. Figure A1 shows a list of WRU (water resource unit) codes, their local and reference gages, and a gage file of related gages and elevation data. These data come from Figures A2 and A3. These relations form the background for discussing the gage-gage algorithm and the example shown in the following paragraphs.

WRU	Local Gage	Reference Gage	WRU	Local Gage	Reference Gage
0XM0001	1	2	0XM0017	3	2
0XM0002	1	2	0XM0018	3	2
0XM0003	1	2	0XM0019	4	3
0XM0005	1	2	0XM0020	4	3
0XM0007	1	2	0XM0021	4	3
0XM0008	1	2	0XM0022	5	4
0XM0009	2	6	0XM0023	6	7
0XM0012	6	7	0XM0024	7	8
0XM0013	6	7	0XM0025	7	8
0XM0014	6	7	0XM0026	7	8
0XM0015	2	6	0XN0001	8	
0XM0016	2	6			

Gage master file (contains gage-gage data from Figure A3; shows only local-with project data):

GAGE FILE

LOCAL / REF.	LOCAL ELEV. / REFERENCE ELEV.						
1 / 2	20 / 15	25 / 20	30 / 25	35 / 30	40 / 35	44.7 / 42	49.5 / 46
2 / 6	2 / 6	19 / 20	29 / 30	38 / 40	42 / 45		

Figure A1. WRU codes, local and reference gages, and gage file

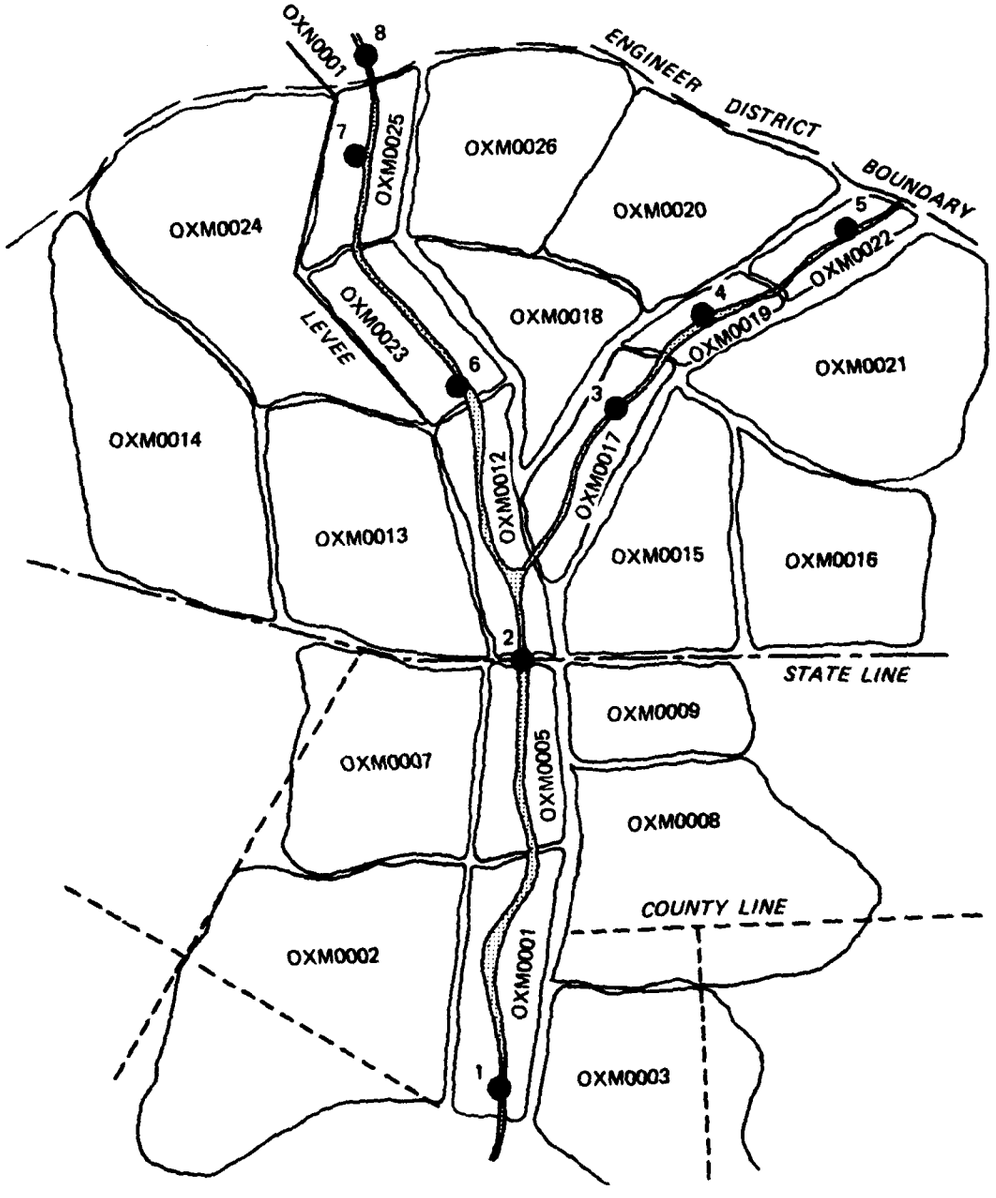


Figure A2. Typical WRU's

2. Data for the gage-gage curves are derived from curves similar to those shown in Figure A3 and are stored in the gage master file.

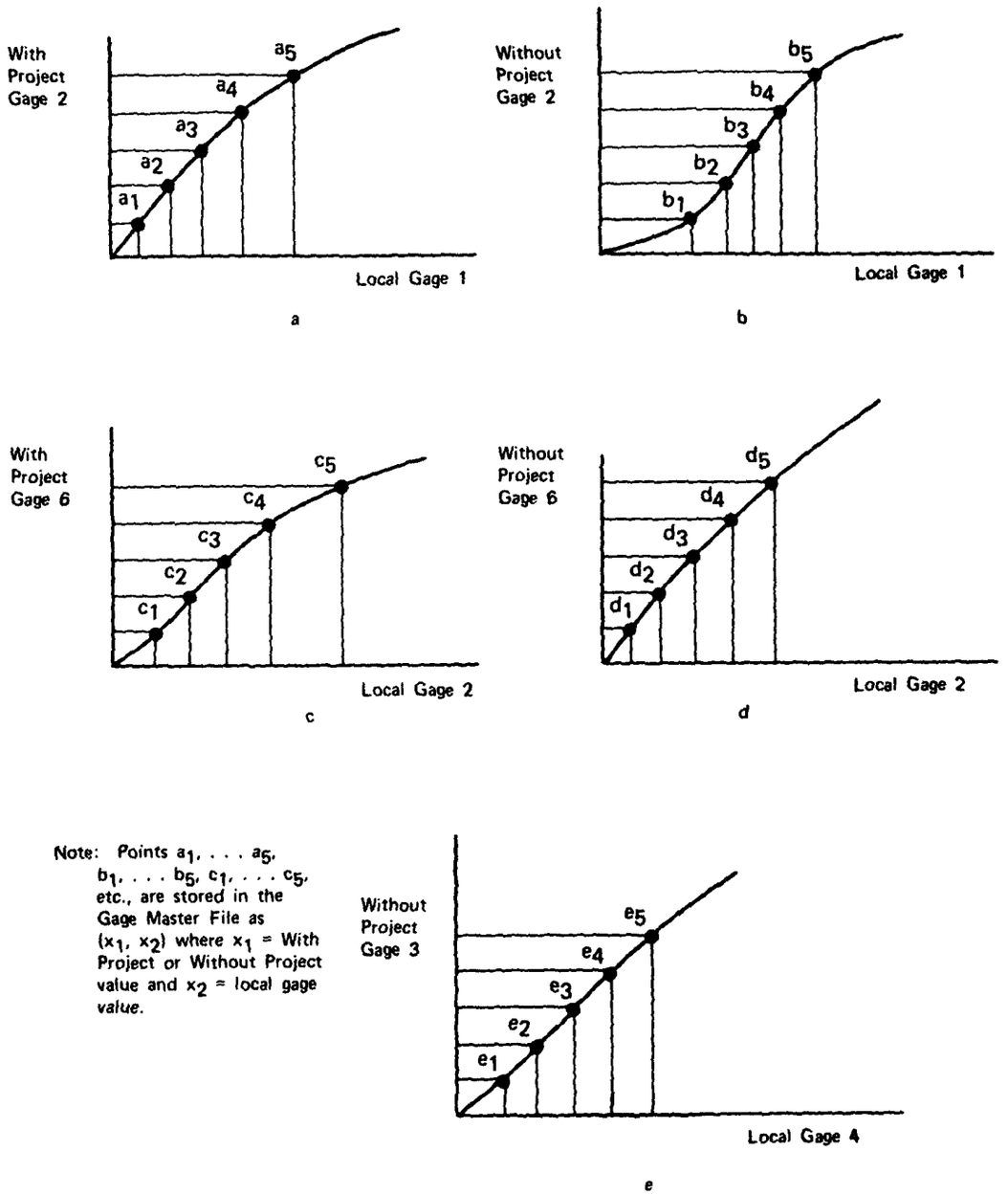


Figure A3. Gage-gage curves

3. Figure A4 illustrates the workings of the gage-gage algorithm. With input of gage data for gages 2 and 6, the program computes readings for gages 1, 3, 4, 5, 7, and 8, all of which are stored for subsequent use. Figure A5 illustrates the computational method used.

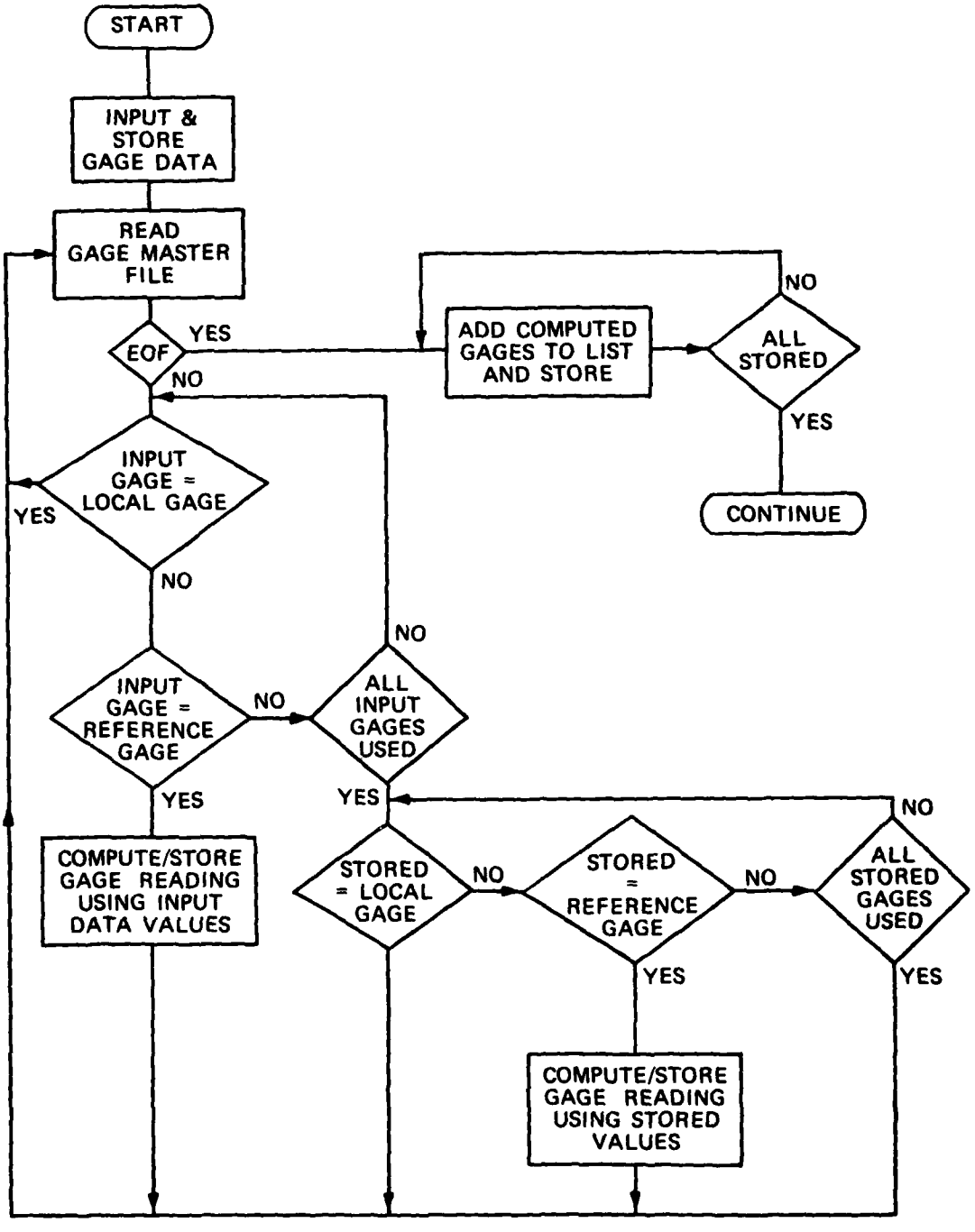


Figure A4. Flow diagram of gage-gage algorithm

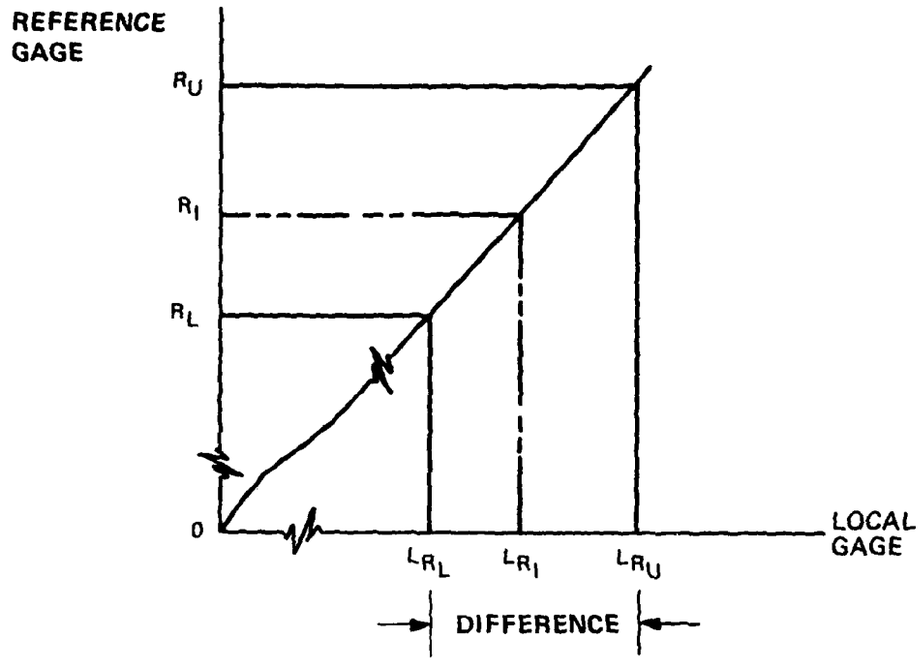


Figure A5. Gage interpolation

a. Assume R_I equals gage 2 with reading of 42.5.

b. Compute interpolation ratio:

$$\text{Ratio} = \frac{R_I - R_L}{R_U - R_L} = \frac{42.5 - 42.0}{46.0 - 42.0} = \frac{0.5}{4.0} = 0.125$$

where

R_I = input gage reading of reference gage

R_L = lower gage reading from reference gage-gage curve (Figure A3)

R_U = upper reading of reference from gage-gage curve

c. Compute local gage difference at points R_L and R_U for reference gage:

$$\text{Difference} = L_{R_U} - L_{R_L} = 49.5 - 44.7 = 4.8$$

where

L_{R_U} = upper local gage value for reference gage value R_U

L_{R_L} = lower local gage value for reference gage value R_L

d. Compute local gage reading:

$$L_{R_I} = L_{R_L} + (\text{Ratio} \times \text{Difference}) = 44.7 + (0.125)(4.8)$$
$$= 44.7 + 0.6$$
$$= 45.3 \text{ ft}^*$$

where L_{R_I} is the computed local gage reading for a given input reference gage R_I. This reading, 45.3, is recorded in the gage file for future use. The program stores local gage code 1 and the computed reading for use in computing readings for subsequent gages. At this point, the program loops back as before.

4. Flood effects are determined next, using the stage-damage curves and the stored gage data. Each WRU is processed in sequence. Its local and reference gages are compared with the stored gages. A match will cause the flood effects to be computed. No match causes the WRU to be passed over. For example, WRU 0XM0002 has a local gage 1 and reference gage 2. Since gages 1 and 2 are both stored, the program uses the gage 1 reading for flood effects. Similarly, all the WRU effects are determined from the stored gages except for 0XN0001. This WRU has no listed reference gage. If gage 8 was not stored, no effects could be computed and it would thus be bypassed.

---

* A table of factors for converting inch-pound units of measurement to metric (SI) units is presented on page 3.

APPENDIX B: INTERACTIVE GRAPHICS

Introduction

Purpose

1. This appendix describes a program designed to display flood effects on an interactive graphics terminal. It is emphasized that this is an *interim and not the final version of the program*. Additional features requested by LMVD have not yet been incorporated.

Scope

2. Discussion and illustrations have been limited to terminal-user interaction. More detailed information on the program can be obtained from WES.

Methodology

3. The basic purpose of the graphics program is to display flood effects in both graphical and tabulated modes. Tabulated results come from data retrieved from the data files produced in the flood damage estimation program. Graphical data are computed within the program using linear interpolation methods between selected contour intervals. This technique produces a flood line that delineates flooded from un-flooded areas. These areas are displayed on the terminal with the flooded areas shaded to highlight them.

Terminal Use

Initiation sequence

4. To initiate program use, the user must log on under his userid and access the graphics program.

System request

5. Upon completion of a successful log on, the user must obtain the graphics program from the library. At the SYSTEM? prompt, he issues the command

```
GET RØKAØFDP/CSTAR,R <CR>
```

to call the program. Upon completing the GET operation, the computer issues another SYSTEM? prompt. The user responds to this with the command FORT for FORTRAN. The next request is for a file name. It appears as

OLD OR NEW?

and the user's response is NEW. This response allows the user to make use of previously compiled programs in binary form which reduce the execution time significantly. The computer next responds with

READY

Thus, the complete response is:

```
SYSTEM? GET RØKAØFDP/CSTAR, R <CR>
SYSTEM? FORT <CR>
OLD OR NEW? NEW <CR>
READY
```

This is followed by a display of

*

Upon display of the "*", the user enters

*GCS2D filename

This response calls in the graphics application package (GCS2D--the two-dimensional Graphics Compatibility System) and the binary program indicated by "filename." In this case, "filename" is CSTAR. Thus, the complete response is:

*GCS2D CSTAR

Note the required space between the two entries. After this entry, the GCS2D program asks for "device"; the user response is TK4. Condensed, it looks like the following sample:

```
CDEWEI HI TIMESHARING ON  09/21/81 AT  9.772 CHANNEL 2143 TSI

USER ID --PGRAGEDP
PASSWORD--
**********
$USER3=028 TI=1000 *MEM-USED=45 CVI=0149 #PPO=2 000-WAIT-0000

*GCS2D PGRAGEDP PLIB CITAP*P
device=TK4

         09/22/81     9.691

DO YOU NEED HELP TO RUN THIS PROGRAM?YES OR NO
=NO

DO YOU WISH TO USE A FILE OF PREVIOUS RESPONSES?
    YES, NO, OR HELP
=NO
DO YOU WISH TO RETAIN YOUR CURRENT SET OF RESPONSES?
    YES, NO, OR  HELP
```

Program Prompts

6. After initiating the graphics program, execution begins. The user is requested to respond to various requests for input via a question-answer sequence. Each prompt takes the form of an = sign. These appear immediately after each program query as illustrated below:

```
DO YOU NEED HELP TO RUN THIS PROGRAM?  YES OR NO
=
```

7. Most prompts will require a YES or NO response or a response of HELP when more explicit directions are needed. Explanations are available at certain points in the program by typing in HELP or a given code for help. Those prompts that require something other than YES, NO, or HELP will be relatively self-explanatory. Once the last response has been entered, the graphics terminal display will blank out and begin displaying the selected geographical region and its associated flood effects. An example of HELP response is below:

```
DO YOU NEED HELP TO RUN THIS PROGRAM?YES OR NO
=YES

   WELCOME.
SINCE THIS IS YOUR FIRST TIME TO RUN THIS PROGRAM
IT IS SUGGESTED THAT YOU MAKE A COPY OF THIS PRINT-
OUT FOR FUTURE USE. THAT WAY YOU WILL NOT NEED IT
EVERY TIME.

   THE  GRAPHICS PROGRAM PERMITS YOU TO.

     DISPLAY A SELECTED AREA.
     SHADE THE FLOODED PORTION OF THAT AREA.
     SELECT AND DRAW GEOGRAPHICAL FEATURES.
     SELECT AND PRINT OUT FLOOD DAMAGES.
     USE A PREVIOUSLY SAVED FILE OF RESPONSES.
     SAVE  YOUR RESPOSES IN A NAMED FILE.

   REQUESTED RESPONSES ARE USUALLY SELF-EXPLANTORY.
 HOWEVER, SHOULD YOU NEED HELP AT ANY  POINT
  TYPE THE WORD,'HELP', AND IT WILL BE PROVIDED.
DO YOU WISH TO USE A FILE OF PREVIOUS RESPONSES?
    YES,NO, OR HELP
=HELP
   USE OF A PREVIOUSLY CREATED AND RETAINED SET
 OF RESPONSES MAY BE DONE BY ATTACHING THAT FILE
 CONTAINING THOSE RESPONSES. THIS REQUIRES KNOWING
 THE FILE NAME OF THE SAVED RESPONSE FILE.
 TO USE RESPOND TO THE FOLLOWING:
DO YOU WISH TO USE A FILE OF PREVIOUS RESPONSES?
    YES,NO, OR HELP
=NO
DO YOU WISH TO RETAIN YOUR CURRENT SET OF RESPONSES?
    YES, NO, OR  HELP
=HELP
   USE OF RESPONSE RETENTION FILE.
 ALL RESPONSES AND DATA VALUES MAY BE RETAINED ON
 THIS FILE.  WHEN REQUESTED SUPPLY A FILENAME OF
 6 CHARACTERS OF LESS.
DO YOU WISH TO RETAIN YOUR CURRENT SET OF RESPONSES?
    YES, NO, OR  HELP
=NO
```

Example Executions

8. In the following examples all user responses are underlined for clarity.

Basic request sequence

9. The basic request sequence is identified as one in which the user desires the WRU to be displayed with its flood lines and detailed

flood effects. All other requests are variations of the responses made in this sequence. The basic request sequence is as follows:

```
DO YOU NEED HELP TO RUN THIS PROGRAM?YES OR NO
=NO

DO YOU WISH TO USE A FILE OF PREVIOUS RESPONSES?
    YES, NO, OR HELP
=NO
DO YOU WISH TO RETAIN YOUR CURRENT SET OF RESPONSES?
    YES, NO, OR  HELP
=NO
 USE FAST RESPONSE ROUTINE?  YES OR NO
=NO
ENTER:PROVIDE RESPONSES AS DIRECTED.

HOW DO YOU WANT AREA DISPLAYED?
      1--HALF SCREEN   2--FULL SCREEN   3--NO DISPLAY
=2
SELECT THE DESIRED DISPLAY AREA:
    1---WRU      2---DISTRICT      3---LMVD       4---BASIN
    5---STREAM      6---COUNTY      7---CONGRESSIONAL DISTRICT
    8----STATE      9---OTHER      10---HELP
=1
ENTER NUMBER OF WRU            TO BE SELECTED.
=1
INPUT  EACH CODE,SEPARATE BY COMMA.
=ND0001
    HOW DO YOU WANT DAMAGE DATA COMPUTED AND PRESENTED:
1--DETAILED/SCREEN   2--SUMMARY/SCREEN    5--NONE
3--DETAILED/OFFLINE  4--SUMMARY/OFFLINE   10--HELP
=1
DO YOU WISH FEATURES DISPLAYED? YES ,NO OR HELP
=YES
INPUT DESIRED FLOOD NUMBER.
=1

  THIS PROGRAM WILL PAUSE AT THE END OF OUTPUT
SO THAT YOU MAY COPY THE DISPLAY IF YOU DESIRE.
  TO CONTINUE EXECUTION  ENTER AN   *   AND GIVE  A
CARRIAGE RETURN.

    YOU HAVE THE OPTION OF COMPUTING FLOOD EFFECTS
WITH FLOOD CONTROL PROJECTS IN PLACE OR WITH THEM REMOVED.
    SELECT THE DESIRED OPTION AS FOLLOWS:
          1--WITH PROJECTS IN PLACE
          2--WITH PROJECTS ASSUMED REMOVED
=1
 ENTER TITLE DATA FOR  OUTPUT. END WITH ^.
=NEW ORLEANS DATA
```

Fast response

10. This routine shortens the time for program execution. It requires that the user know ahead of time the correct responses to make. The basic request sequence for fast response is as follows:

```
DO YOU NEED HELP TO RUN THIS PROGRAM?YES OR NO
=NO

DO YOU WISH TO USE A FILE OF PREVIOUS RESPONSES?
    YES,NO, OR HELP
=NO
DO YOU WISH TO RETAIN YOUR CURRENT SET OF RESPONSES?
    YES, NO, OR  HELP
=NO
 USE FAST RESPONSE ROUTINE?  YES OR NO
=YES
GIVE  ANSWERS AS DESIRED; SEPARATE BY COMMA.
    DESIRED DISPLAY CODE(1,2,3)
    DESIRED DISPLAY AREA
    NUMBER OF CODES
=1,1,1
    CODES FOR DISPLAY AREA
=NOD0001
    DAMAGE COMPUTATION/DISPLAY MODE
    FEATURES DESIRED-YES OR NO
    FLOOD NUMBER TO USE
=1,NO,1

  THIS PROGRAM WILL PAUSE AT THE END OF OUTPUT
SO THAT YOU MAY COPY THE DISPLAY IF YOU DESIRE.
  TO CONTINUE EXECUTION  ENTER AN    *    AND GIVE  A
CARRIAGE RETURN.

    YOU HAVE THE OPTION OF COMPUTING FLOOD EFFECTS
WITH FLOOD CONTROL PROJECTS IN PLACE OR WITH THEM REMOVED.
    SELECT THE DESIRED OPTION AS FOLLOWS:
          1--WITH PROJECTS IN PLACE
          2--WITH PROJECTS ASSUMED REMOVED
=1
 ENTER TITLE DATA FOR  OUTPUT. END WITH '\'.
=NEW ORLEANS DATA
```

Addition of features to display

11. This sequence provides for adding features to the WRU display:

```
DO YOU WISH FEATURES DISPLAYED? YES ,NO OR HELP
=YES
INPUT DESIRED FLOOD NUMBER.
=1

  THIS PROGRAM WILL PAUSE AT THE END OF OUTPUT
SO THAT YOU MAY COPY THE DISPLAY IF YOU DESIRE.
  TO CONTINUE EXECUTION  ENTER AN   *   AND GIVE  A
CARRIAGE RETURN.

    YOU HAVE THE OPTION OF COMPUTING FLOOD EFFECTS
WITH FLOOD CONTROL PROJECTS IN PLACE OR WITH THEM REMOVED.
    SELECT THE DESIRED OPTION AS FOLLOWS:
          1--WITH PROJECTS IN PLACE
          2--WITH PROJECTS ASSUMED REMOVED
=1
 ENTER TITLE DATA FOR  OUTPUT. END WITH '\'.
=NEW ORLEANS DATA
INPUT CODES FOR DESIRED FEATURES, ONE AT A TIME

          CP COUNTY BOUNDARY
          CD CONGRESSIONAL DISTRICT BOUNDARY
          CI CONTOUR INTERVAL
          DB DISTRICT BOUNDARY
          MR MAINSTEM RIVER
          SB STATE BOUNDARY
          TR TRIBUTARY BOUNDARY
WHEN FINISHED, TYPE: QT
INPUT FEATURE  CODE.
=CB
INPUT FEATURE  CODE.
=DB
INPUT FEATURE  CODE.
=CD
INPUT FEATURE  CODE.
=QT
```

Summary effects display

12. Summary effects are the summarized results of flooding in the affected area. These may be displayed in lieu of detailed effects:

```
    HOW DO YOU WANT DAMAGE DATA COMPUTED AND PRESENTED:
1--DETAILED/SCREEN    2--SUMMARY/SCREEN     5--NONE
3--DETAILED/OFFLINE   4--SUMMARY/OFFLINE    10--HELP
=10
FLOOD EFFECTS MAY BE COMPUTED IN DETAIL OR SUMMARY
 FORM AND STORED IN A FILE FOR FUTURE PRINT OUT.
 THESE GIVE THE FLOOD EFFECTS ON PROPERTY,CROPS, LAND,
 AND PEOPLE.
```

```
    HOW DO YOU WANT DAMAGE DATA COMPUTED AND PRESENTED:
1--DETAILED/SCREEN    2--SUMMARY/SCREEN     5--NONE
3--DETAILED/OFFLINE   4--SUMMARY/OFFLINE    10--HELP
=1
   YOU HAVE SELECTED OPTIONS THAT CONFLICT WITH EACH
 OTHER-FULL SCREEN AND FLOOD EFFECTS DISPLAY CANNOT BE
 DONE SIMULTANEOUSLY,ONE HAS TO BE CHANGED.
   PLEASE RESUBMIT RESPONSES AS DESIRED:

   CHANGE SELECTION OF:
     1--AREA DISPLAY
     2--EFFECTS DISPLAY
  SELECT ONE.
=1
HOW DO YOU WANT AREA DISPLAYED?
      1--HALF SCREEN    2--FULL SCREEN    3--NO DISPLAY
=1
SELECT THE DESIRED DISPLAY AREA:
    1---WRU      2---DISTRICT      3---LMVD       4---BASIN
    5---STREAM       6---COUNTY       7---CONGRESSIONAL DISTRICT
    8----STATE       9---OTHER      10---HELP
=1
```

Examples

13. Several examples of various combinations of options are included below to illustrate the various outputs to the program. Each is in two parts: a response and a results part. Example 1 is a normal beginning to program execution. Example 2 is a continuation showing selection of a different WRU. Example 3 is Example 2 changed to display selected features and effects. Example 4 is a change to display a different feature. Example 5 shows how more than one WRU may be displayed at once through the translation techniques used by the program. This allows for displaying large areas containing many WRU's.

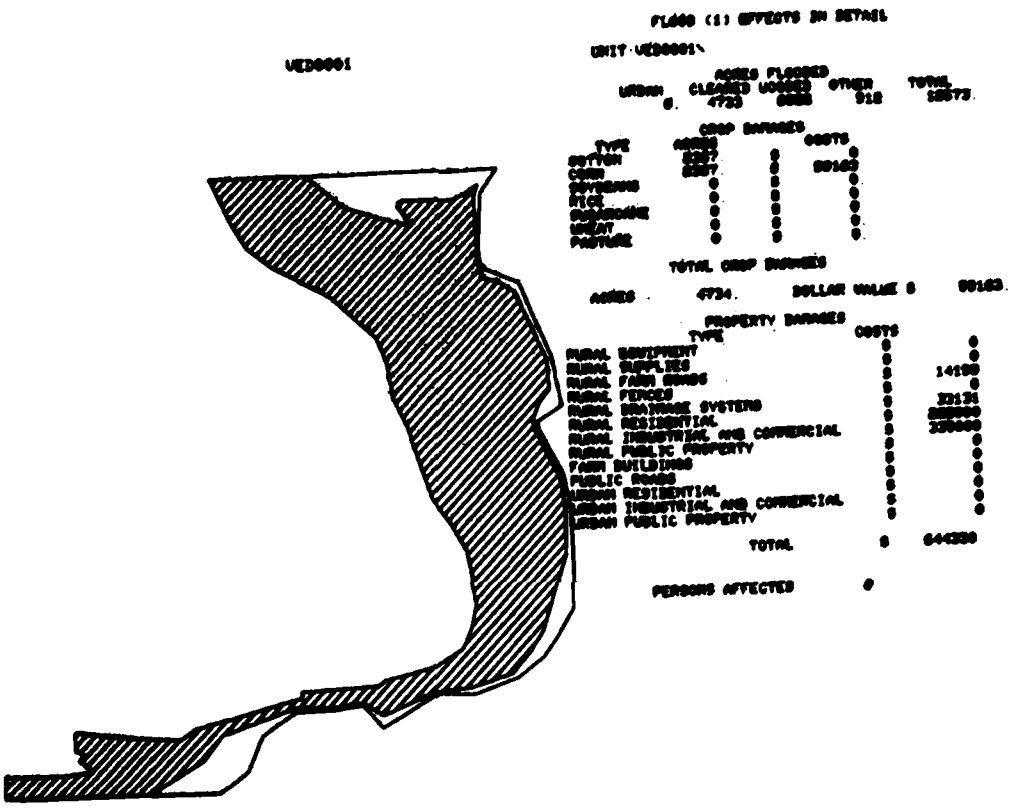
Computer sign off

14. Upon completion of all desired operations, the program can be terminated according to the following sequence. Upon receiving the NO response, the program returns to the SYSTEM level and the user signs off the terminal by entering the command BYE.

```
RUN COMPLETE.

DO YOU WISH TO RUN AGAIN?  YES OR NO
=NO
```

```
***   WES-TSS NOTIFIED      ***


*IS SERIES 600 ON  07 19/78 AT  8.172  CHANNEL 2450

user id -R0KAD!DP
password--
BROGUBNOEPWR

SYSTEM ?FORT NEW
READY
*DC52D CSTAR
device-TK4

        07/19/78    08.192

DO YOU NEED HELP TO RUN THIS PROGRAM?YES OR NO
*NO

DO YOU WISH TO USE A FILE OF PREVIOUS RESPONSES?
    YES,NO, OR HELP
*NO
DO YOU WISH TO RETAIN YOUR CURRENT SET OF RESPONSES?
    YES, NO, OR  HELP
*NO
 USE FAST RESPONSE ROUTINE?  YES OR NO
*YES
GIVE  ANSWERS AS DESIRED; SEPARATE BY COMMA.
    DESIRED DISPLAY CODE(1,2,3)
    DESIRED DISPLAY AREA
    NUMBER OF CODES
*1,1,1
    CODES FOR DISPLAY AREA
*4/J0001
    DAMAGE COMPUTATION/DISPLAY MODE
    FEATURES DESIRED-YES OR NO
    FLOOD NUMBER TO USE
*1,NO,1

  THIS PROGRAM WILL PAUSE AT THE END OF OUTPUT
SO THAT YOU MAY COPY THE DISPLAY IF YOU DESIRE.
  TO CONTINUE EXECUTION  ENTER AN   $   AND GIVE  A
CARRIAGE RETURN.

    YOU HAVE THE OPTION OF COMPUTING FLOOD EFFECTS
WITH FLOOD CONTROL PROJECTS IN PLACE OR WITH THEM REMOVED.
    SELECT THE DESIRED OPTION AS FOLLOWS:
          1--WITH PROJECTS IN PLACE
          2--WITH PROJECTS ASSUMED REMOVED
*1
 ENTER TITLE DATA FOR  OUTPUT. END WITH '\'.
*VELC--
```

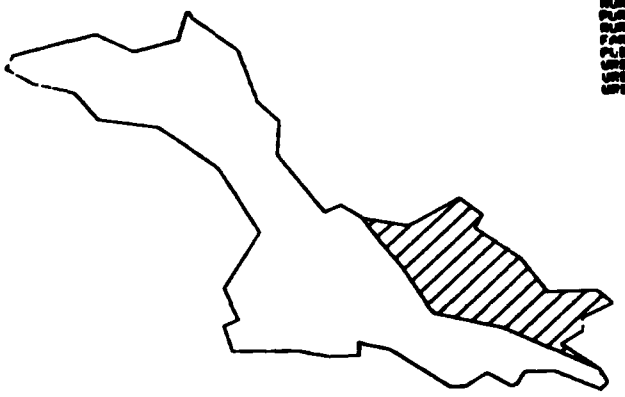
Example Ia


FLOOD (S) EFFECTS IN DETAIL
UNIT-WE00001
WE00001
ACRES FLOODED
URBAN
CLEARED
WOODED
OTHER
TOTAL
0.
4723
918
12572.
CROP DAMAGES
TYPE
ACRES
COSTS
COTTON
CORN
SOYBEANS
RICE
SORGHUM
WHEAT
PASTURE
TOTAL CROP DAMAGES
ACRES
4734.
DOLLAR VALUE $
PROPERTY DAMAGES
TYPE
COSTS
RURAL EQUIPMENT
RURAL SUPPLIES
RURAL FARM ROADS
RURAL FENCES
RURAL DRAINAGE SYSTEMS
RURAL RESIDENTIAL
RURAL INDUSTRIAL AND COMMERCIAL
RURAL PUBLIC PROPERTY
FARM BUILDINGS
PUBLIC ROADS
URBAN RESIDENTIAL
URBAN INDUSTRIAL AND COMMERCIAL
URBAN PUBLIC PROPERTY
TOTAL
$
PERSONS AFFECTED

Example 1b

```
RUN COMPLETE.

DO YOU WISH TO RUN AGAIN?  YES OR NO
*YES
DO YOU WISH TO USE A FILE OF PREVIOUS RESPONSES?
    YES,NO, OR HELP
*NO
DO YOU WISH TO RETAIN YOUR CURRENT SET OF RESPONSES?
    YES, NO, OR  HELP
*NO
 USE FAST RESPONSE ROUTINE?  YES OR NO
*YES
GIVE  ANSWERS AS DESIRED; SEPARATE BY COMMA.
    DESIRED DISPLAY CODE(1,2,3)
    DESIRED DISPLAY AREA
    NUMBER OF CODES
*1;1;1
 1;1;1
  ^
FILE CODE @5 ILLEGAL CHAR; CORRECTION *1,1,1
    CODES FOR DISPLAY AREA
*NO@@@@1
    DAMAGE COMPUTATION/DISPLAY MODE
    FEATURES DESIRED-YES OR NO
    FLOOD NUMBER TO USE
*1,NO,1

  THIS PROGRAM WILL PAUSE AT THE END OF OUTPUT
SO THAT YOU MAY COPY THE DISPLAY IF YOU DESIRE.
  TO CONTINUE EXECUTION  ENTER AN    *    AND GIVE  A
CARRIAGE RETURN.

    YOU HAVE THE OPTION OF COMPUTING FLOOD EFFECTS
WITH FLOOD CONTROL PROJECTS IN PLACE OR WITH THEM REMOVED.
    SELECT THE DESIRED OPTION AS FOLLOWS:
          1--WITH PROJECTS IN PLACE
          2--WITH PROJECTS ASSUMED REMOVED

*1
 ENTER TITLE DATA FOR  OUTPUT. END WITH '\'.
*NEW ORLEANS AREA\
```

Example 2a



FLOOD (1) EFFECTS IN DETAIL

UNIT:NEW ORLEANS AREA

ACRES FLOODED				
URBAN	CLEARED	WOODED	OTHER	TOTAL
0.	0.	0.	0.	0.

PROPERTY DAMAGES		
TYPE	COSTS	
RURAL EQUIPMENT	0	0.
RURAL SUPPLIES	0	0.
RURAL FARM ROADS	0	0.
RURAL FENCES	0	0.
RURAL DRAINAGE SYSTEMS	0	0.
RURAL RESIDENTIAL	0	0.
RURAL INDUSTRIAL AND COMMERCIAL	0	0.
RURAL PUBLIC PROPERTY	0	0.
FARM BUILDINGS	0	0.
PUBLIC ROADS	0	0.
URBAN RESIDENTIAL	0	0.
URBAN INDUSTRIAL AND COMMERCIAL	0	0.
URBAN PUBLIC PROPERTY	0	0.
TOTAL	0	0.

PERSONS AFFECTED 0

Example 2b

```
RUN COMPLETE.

DO YOU WISH TO RUN AGAIN?  YES OR NO
*YES
DO YOU WISH TO USE A FILE OF PREVIOUS RESPONSES?
    YES,NO, OR HELP
*NO
DO YOU WISH TO RETAIN YOUR CURRENT SET OF RESPONSES?
    YES, NO, OR  HELP
*NO
 USE FAST RESPONSE ROUTINE?  YES OR NO
*NO
USER:PROVIDE RESPONSES AS DIRECTED.

HOW DO YOU WANT AREA DISPLAYED?
      1--HALF SCREEN    2--FULL SCREEN    3--NO DISPLAY
*1
SELECT THE DESIRED DISPLAY AREA:
    1---URU      2---DISTRICT      3---LAND       4---BASIN
    5---STREAM     6---COUNTY      7---CONGRESSIONAL DISTRICT
    8----STATE     9---OTHER      10---HELP
*1
ENTER NUMBER OF URU            TO BE SELECTED.
*1
INPUT  EACH CODE,SEPARATE BY COMMA.
*NOD0001
    HOW DO YOU WANT DAMAGE DATA COMPUTED AND PRESENTED:
1--DETAILED/SCREEN   2--SUMMARY/SCREEN    5--NONE
3--DETAILED/OFFLINE  4--SUMMARY/OFFLINE   10--HELP
*2
DO YOU WISH FEATURES DISPLAYED? YES ,NO OR HELP
*YES
INPUT DESIRED FLOOD NUMBER.
*1

  THIS PROGRAM WILL PAUSE AT THE END OF OUTPUT
SO THAT YOU MAY COPY THE DISPLAY IF YOU DESIRE.
  TO CONTINUE EXECUTION  ENTER AN   S   AND GIVE  A
CARRIAGE RETURN.

    YOU HAVE THE OPTION OF COMPUTING FLOOD EFFECTS
WITH FLOOD CONTROL PROJECTS IN PLACE OR WITH THEM REMOVED.
    SELECT THE DESIRED OPTION AS FOLLOWS:
          1--WITH PROJECTS IN PLACE
          2--WITH PROJECTS ASSUMED REMOVED
*1
 ENTER TITLE DATA FOR  OUTPUT. END WITH '\'.
*NEW ORLEANS AREA\
INPUT CODES FOR DESIRED FEATURES, ONE AT A TIME

          CB COUNTY BOUNDARY
          CD CONGRESSIONAL DISTRICT BOUNDARY
          CI CONTOUR INTERVAL
          DB DISTRICT BOUNDARY
          MR MAINSTEM RIVER
          SD STATE BOUNDARY
          TR TRIBUTARY BOUNDARY
WHEN FINISHED, TYPE: QT
INPUT FEATURE  CODE.
*SD
INPUT FEATURE  CODE.
*QT
```

Example 3a

NEW ORLEANS AREA

FLOOD (1) EFFECTS SUMMARY

UNIT:NEW ORLEANS AREA

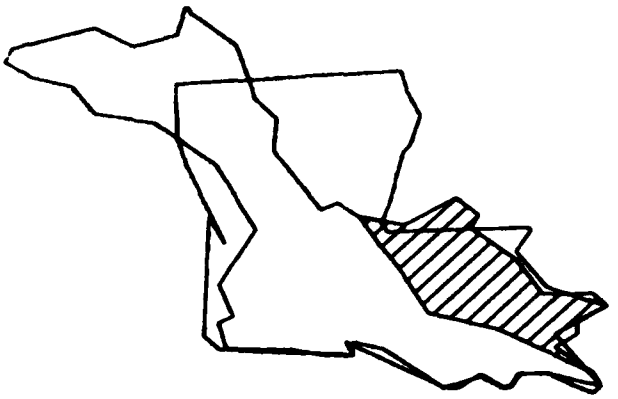
TOTAL ACRES FLOODED 0.

TOTAL CROP DAMAGES

ACRES 0. DOLLAR VALUE 0 0.

TOTAL PROPERTY DAMAGES 0 0.

PERSONS AFFECTED 0



Example 3b

```
RUN COMPLETE.

DO YOU WISH TO RUN AGAIN?  YES OR NO
•YES
DO YOU WISH TO USE A FILE OF PREVIOUS RESPONSES?
   YES,NO, OR HELP
•NO
DO YOU WISH TO RETAIN YOUR CURRENT SET OF RESPONSES?
   YES, NO, OR  HELP
•NO
 USE FAST RESPONSE ROUTINE?  YES OR NO
•NO
USER:PROVIDE RESPONSES AS DIRECTED.

HOW DO YOU WANT AREA DISPLAYED?
     1--HALF SCREEN   2--FULL SCREEN   3--NO DISPLAY
•1
SELECT THE DESIRED DISPLAY AREA:
    1---URU      2---DISTRICT      3---LRVD       4---BASIN
    5---STREAM     6---COUNTY      7---CONGRESSIONAL DISTRICT
    8----STATE     9---OTHER      10---HELP
•1
ENTER NUMBER OF URU            TO BE SELECTED.
•1
INPUT  EACH CODE,SEPARATE BY COMMA.
•NOD0001
    HOW DO YOU WANT DAMAGE DATA COMPUTED AND PRESENTED:
1--DETAILED/SCREEN   2--SUMMARY/SCREEN    5--NONE
3--DETAILED/OFFLINE  4--SUMMARY/OFFLINE   10--HELP
•2
DO YOU WISH FEATURES DISPLAYED? YES ,NO OR HELP
•YEWS
INPUT DESIRED FLOOD NUMBER.
•1

  THIS PROGRAM WILL PAUSE AT THE END OF OUTPUT
SO THAT YOU MAY COPY THE DISPLAY IF YOU DESIRE.
  TO CONTINUE EXECUTION  ENTER AN   X   AND GIVE  A
CARRIAGE RETURN.

    YOU HAVE THE OPTION OF COMPUTING FLOOD EFFECTS
WITH FLOOD CONTROL PROJECTS IN PLACE OR WITH THEM REMOVED.
    SELECT THE DESIRED OPTION AS FOLLOWS:
          1--WITH PROJECTS IN PLACE
          2--WITH PROJECTS ASSUMED REMOVED

•1
 ENTER TITLE DATA FOR  OUTPUT. END WITH '\'.
•NEW ORLEANS AREA\
INPUT CODES FOR DESIRED FEATURES, ONE AT A TIME

          CB COUNTY BOUNDARY
          CD CONGRESSIONAL DISTRICT BOUNDARY
          CI CONTOUR INTERVAL
          DB DISTRICT BOUNDARY
          MR MAINSTEM RIVER
          SB STATE BOUNDARY
          TR TRIBUTARY BOUNDARY
WHEN FINISHED, TYPE: GT
INPUT FEATURE  CODE.
•CB
INPUT FEATURE  CODE.
•CI
INPUT FEATURE  CODE.
•GT
```

Example 4a

NEW ORLEANS AREA

FLOOD (1) EFFECTS SUMMARY

UNITIMEN ORLEANS AREA

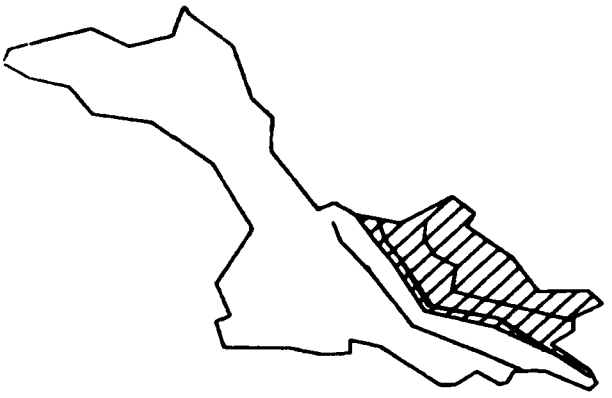
TOTAL ACRES FLOODED 0.

TOTAL CROP DAMAGES

ACRES 0. DOLLAR VALUE 0 0.

TOTAL PROPERTY DAMAGES 0 0.

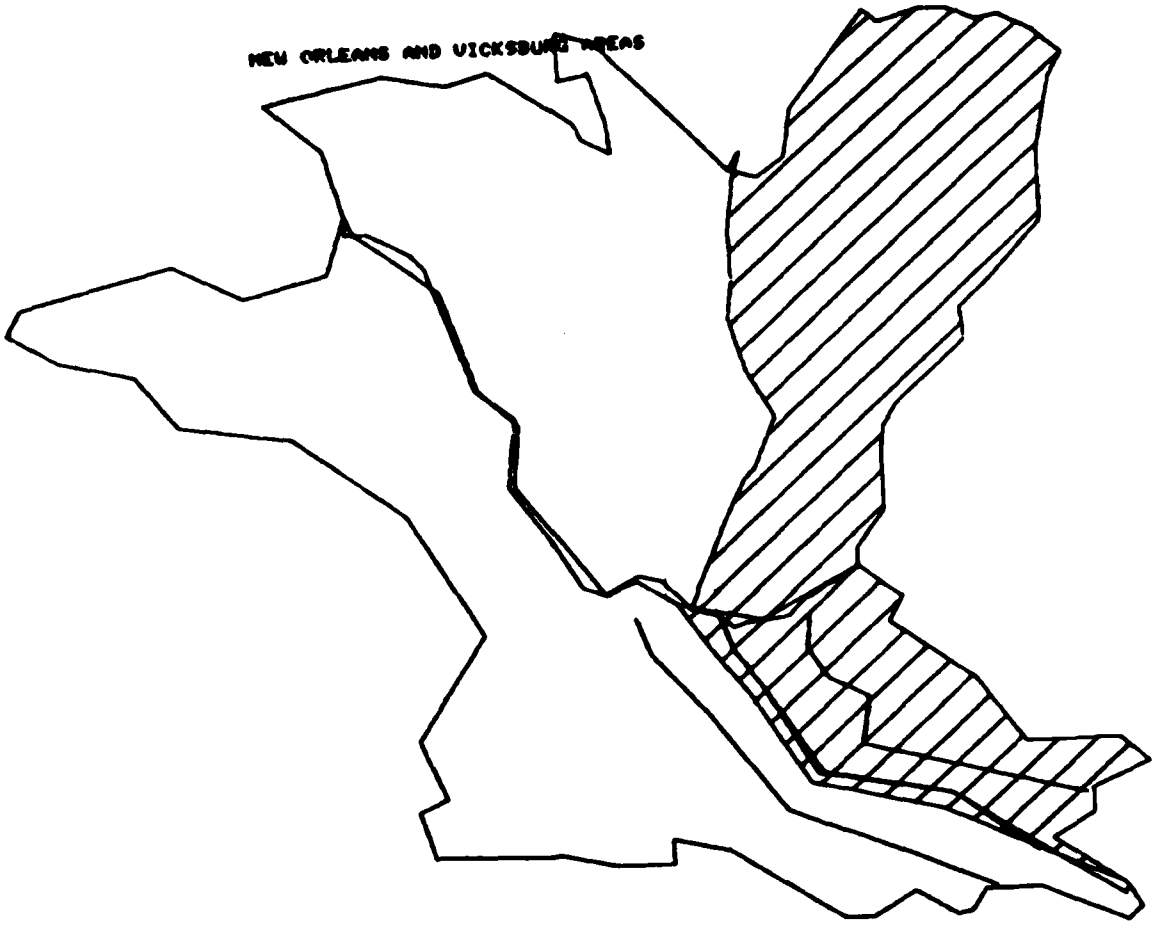
PERSONS AFFECTED 0



Example 4b

```
RUN COMPLETE.

DO YOU WISH TO RUN AGAIN?  YES OR NO
•YES
DO YOU WISH TO USE A FILE OF PREVIOUS RESPONSES?
    YES,NO, OR HELP
•NO
DO YOU WISH TO RETAIN YOUR CURRENT SET OF RESPONSES?
    YES, NO, OR  HELP
•NO
 USE FAST RESPONSE ROUTINE?  YES OR NO
•NO
USER:PROVIDE RESPONSES AS DIRECTED.

HOW DO YOU WANT AREA DISPLAYED?
      1--HALF SCREEN   2--FULL SCREEN   3--NO DISPLAY
•2
SELECT THE DESIRED DISPLAY AREA:
    1---URU       2---DISTRICT      3---LRUD       4---BASIN
    5---STREAM    6---COUNTY        7---CONGRESSIONAL DISTRICT
    8----STATE    9---OTHER        10---HELP
•1
ENTER NUMBER OF URU            TO BE SELECTED.
•2
INPUT  EACH CODE,SEPARATE BY COMMA.
•MOD0001,VED0001
    HOW DO YOU WANT DAMAGE DATA COMPUTED AND PRESENTED:
1--DETAILED/SCREEN   2--SUMMARY/SCREEN    5--NONE
3--DETAILED/OFFLINE  4--SUMMARY/OFFLINE   10--HELP
•5
DO YOU WISH FEATURES DISPLAYED? YES ,NO OR HELP
•YES
INPUT DESIRED FLOOD NUMBER.
•1

  THIS PROGRAM WILL PAUSE AT THE END OF OUTPUT
SO THAT YOU MAY COPY THE DISPLAY IF YOU DESIRE.
  TO CONTINUE EXECUTION  ENTER AN   S   AND GIVE  A
CARRIAGE RETURN.

    YOU HAVE THE OPTION OF COMPUTING FLOOD EFFECTS
WITH FLOOD CONTROL PROJECTS IN PLACE OR WITH THEM REMOVED.
    SELECT THE DESIRED OPTION AS FOLLOWS:
          1--WITH PROJECTS IN PLACE
          2--WITH PROJECTS ASSUMED REMOVED
•1
 ENTER TITLE DATA FOR  OUTPUT. END WITH '\'.
•NEW ORLEANS AND VICKSBURG AREAS\
INPUT CODES FOR DESIRED FEATURES, ONE AT A TIME

          CB COUNTY BOUNDARY
          CB CONGRESSIONAL DISTRICT BOUNDARY
          CI CONTOUR INTERVAL
          DB DISTRICT BOUNDARY
          MR MAINSTEM RIVER
          SB STATE BOUNDARY
          TR TRIBUTARY BOUNDARY
WHEN FINISHED, TYPE: QT
INPUT FEATURE  CODE.
•DB
INPUT FEATURE  CODE.
•QT
```

Example 5a



Example 5b

In accordance with letter from DAEN-RDC, DAEN-ASI dated 22 July 1977, Subject: Facsimile Catalog Cards for Laboratory Technical Publications, a facsimile catalog card in Library of Congress MARC format is reproduced below.

Enete, Walter L.
User's guide to the flood damage estimation system / by Walter L. Enete (Automatic Data Processing Center, U.S. Army Engineer Waterways Experiment Station). -- Vicksburg, Miss. : The Station ; Springfield, Va. : available from NTIS, 1982.
38 p. in various pagings : ill. ; 27 cm. -- (Instruction report ; K-82-1)
Cover title.
"January 1982."
Final report.
"Prepared for U.S. Army Engineer Division, Lower Mississippi Valley."
1. Computer programs. 2. Flood damage prevention. 3. Flood forecasting. I. United States. Army. Corps of Engineers. Lower Mississippi Valley Division. II. U.S. Army Engineer Waterways Experiment Station. Automatic Data Processing Center. III. Title IV. Series: Instruction report (U.S. Army Engineer Waterways Experiment Station) ; K-82-1.
TA7.W34i no.K-82-1